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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/641,589	08/18/2000	Philip A. Cooper	11910-002001	6655

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EXAMINER
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BORLINGHAUS, JASON M

ART UNIT	PAPER NUMBER
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3628

DATE MAILED: 09/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/641,589

Applicant(s)

COOPER ET AL.

Examiner

Jason M. Borlinghaus

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 May 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,8-10 and 27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,8-10 and 27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some.\* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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## DETAILED ACTION

### *Specification*

The disclosure is objected to because of the following informalities: enclosure of appendix is improper. An appendix is limited to enclosure of a sequence listing table or a computer program listing (see MPEP § 608.05). Otherwise, information contained within the appendix should be incorporated into the specification or filed through an IDS.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1 and 8 - 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over Admission (specification and appendix).

**Regarding Claim 1**, Admission discloses a method comprising:

- receiving data representing prices of options on a given asset (The idea that option prices determine some kind of implied probability distribution is fairly well known in the financial literature – see Appendix A, p. 1); and
- performing computations (second derivative) to derive from said data an estimate of a corresponding implied probability distribution of the price of said asset at a future time. (“The idea that a pdf can be computed by taking the second derivative of a continuous price curve is known in the literature, but it does not appear to be very well known.” – see Appendix A, p. 1).

Admission does not teach a machine-based method comprising:

- receiving data representing current prices of options on a given asset;
- by machine, performing computations to derive from said data an estimate of a corresponding implied probability distribution of the price of said asset at a future time; and
- making information about said probability distribution available within a time frame that is useful to investors.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Admission by incorporating the ability to input current prices of options into the calculations to provide the most up-to-date data for the calculations.

Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Admission by incorporating the ability to

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make the information from the calculations available in a time frame that is useful for investors, allowing the investors to actually utilize the information derived from the calculations.

Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have automated the method, since it has been held that broadly providing a mechanical or automatic means to replace manual activity that accomplishes the same result involves only routine skill in the art. *In re Venner*, 120 USPQ 192.

**Regarding Claim 8**, Admission discloses a method comprising:

- receiving data representing prices of options on a given asset, the options being associated with spaced-apart strike prices of the asset at a future time. (supra – specification, p. 9);
- the data including shifted prices of options resulting from a shifted underlying price of the asset. (“In the real world, the price s of the underlying asset changes with time and there will be a corresponding change in option prices.” – see specification, p. 12 – establishing that as the price of the underlying asset shifts there is a corresponding shift in the option price, as is the nature of options in the existing option market);
- the amount by which the asset price has shifted being different from the amount by which the strike prices are spaced apart. (“In practice, options are usually traded within certain price ranges and only for certain price intervals (e.g. ranging from \$110 to \$180 at \$5 intervals). Thus, the call

and/or put option prices are known only for a finite subset of strike prices.”

– see specification, p. 9 - establishing that strike prices, by the nature of the options market, are only available in a finite number of spaced-apart price intervals. However, the price or value of the underlying asset does not have this limitation. The price or value of the underlying asset is not limited to a finite number of spaced-apart intervals and, therefore, the constrained strike prices cannot fully and accurately capture the infinite asset prices possible. As such the amount of the shift (increase or decrease) in the asset price (infinite possibilities) is different from the amount by which the strike prices are spaced apart (finite intervals));

- performing computations to derive from said data an estimate of a quantized implied probability distribution of the price of said asset at a future time. (“The idea that a pdf can be computed by taking the second derivative of a continuous price curve is known in the literature, but it does not appear to be very well known.” – see Appendix A, p. 1); and
- the elements of the quantized probability distribution being more finely spaced (smoothed) than for a probability distribution derived without the shifted current price data. (“Any standard smoothing and extrapolation method may be used...In an especially meaningful; example, we have experimented with a class of smoothing algorithms used in ‘Implied Volatility Functions: Empirical Tests’ by B. Dumas, J Fleming and R.E. Whaley, J.Finance, vol. 53, pp. 2059 – 2106, Dec. 1998...Thus, we use

the Dumas-Fleming-Whaley model for our own entirely different purpose, that of forecasting probability distributions.” – see appendix, p. 8).

Admission does not teach a method comprising:

- receiving data representing current prices of options on a given asset, the options being associated with spaced-apart strike prices of the asset at a future time;
- the data including shifted current prices of options resulting from a shifted underlying price of the asset; and
- by machine, performing computations to derive from said data an estimate of a quantized implied probability distribution of the price of said asset at a future time...

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Admission by incorporating the ability to input current prices of options into the calculations to provide the most up-to-date data for the calculations.

Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have automated the method, since it has been held that broadly providing a mechanical or automatic means to replace manual activity that accomplishes the same result involves only routine skill in the art. *In re Venner*, 120 USPQ 192.

**Regarding Claim 9**, Claim 9 recites similar limitations to Claims 1 and 8, in combination, and is therefore rejected using the same art and rationale as applied in the rejection of Claims 1 and 8.

**Regarding Claim 10**, Admission does not teach a method in which the smoothing operation is performed in a volatility domain. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified smoothing operation, as disclosed by Admission, to allow for smoothing in any domain or for any variable that the inventor desired.

**Claims 2 - 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Admission, as in Claim 1 above, and in further view of Jackwerth (Jackwerth, Jens Carsten & Rubenstein, Mark. *Recovering Probability Distributions from Option Prices*. *The Journal of Finance*. vol. LI, no. 5. December 1996. pp. 1611 – 1631).

**Regarding Claim 2**, Admission discloses a method in which:

- data represent a finite number of price of options at spaced-apart (certain price intervals) strike prices of the asset. ("In practice, options are usually traded within certain price ranges and only for certain price intervals (e.g. ranging from \$110 to \$180 at \$5 intervals). Thus, the call and/or put option prices are known only for a finite subset of strike prices." – see specification, p. 9 – establishing that strike prices, by the nature of the options market, are only available in a finite number of spaced-apart price intervals.)



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- calculating a set of first set of differences (first derivative) of said prices.  
("The idea that a pdf can be computed by taking the second derivative of a continuous price curve is known in the literature, but it does not appear to be very well known." – see Appendix A, p. 1 – establishing that, by virtue of calculating a second derivative, a first set of differences (a first derivative) must be calculated from option price data).

Admission does not teach a method in which:

- data represent a finite number of price of options at spaced-apart strike prices of the asset, and also including;
- calculating a set of first differences of said finite number of prices to form an estimate of the cumulative probability distribution of the price of the asset at a future time.

Jackwerth discloses a method in which

- data represent a finite number of strike prices of options at spaced-apart strike prices of the asset. ("Unfortunately, since observed option prices are only available in discretely space striking price levels, the lowest available striking price is well above 0 and the highest is well below infinity, there are many risk-neutral distributions that can risk-neutral distributions that can fit their market prices." – see p. 1620 – strike prices, by their nature, must be finite and spaced-apart); and
- calculating a set of first differences (equation 5 – see p. 1620) of said finite number (dataset) of prices to form an estimate of the cumulative

probability distribution of the price of the asset. (“...by carefully executing the optimization and monitoring the convergence, we are able to display implied probability distributions and implied cumulative probability distributions for the same dataset for all these functions.” – see pp. 1620-1621).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have recognized that inputted strike price data would represent a finite number of spaced-apart strike prices, as disclosed by Admission and Jackwerth, as is the nature of strike prices.

Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the first set of differences calculated, as disclosed by Admission, to form an estimate of the cumulative probability distribution of the price of the asset, as disclosed by Jackwerth, to provide the user with a cumulative probability distribution.

**Regarding Claim 3**, Admission discloses a method also including:

- calculating a set of second differences (second derivative) of the finite number of strike prices from the set of first differences (first derivative) to form an estimate of the probability distribution function of the price of said asset at a future time (supra – see Appendix, p. 1).

**Claim 27** is rejected under 35 U.S.C. 103(a) as being unpatentable over Admission in view of Mendenhall (Mendenhall, William & Beaver, Robert J. *A Brief*

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*Course in Business Statistics. Wadsworth Publishing Company. Belmont, California.*

1995. p. 177).

- defining a current value of an option as a quadratic expression that that depends on the difference between the current price of the option and the current price of the underlying security. (“The well-known idea is to think of an option as a kind of nonlinear portfolio – a quadratic one, to be more precise. Thus, an option on a single underlying security with underlying price  $x_1$  has a price approximately  $x = c + \Delta (x_1 - s_1) + \frac{1}{2} \Gamma (x_1 - s_1)^2$  for  $x_1$  near  $s_1$ , where the option was evaluated to a known value  $c$ .” – see appendix, p. 18); and
- performing computations that use the quadratic expression (supra – see appendix, p. 18)
- to estimate a probability distribution of the value (PDF computed from second derivative of portfolio value  $x$ ) at a future time  $T$  of a portfolio that includes the option (portfolio with only one item, the option). (“The idea that a pdf can be computed by taking the second derivative of a continuous price curve is known in the literature, but it does not appear to be very well known.” – see Appendix A, p. 1).

Admission does not disclose a machine-based method comprising:

- by machine, computations that use the quadratic expression and Monte Carlo techniques to estimate a probability distribution of the value at a future time  $T$  of a portfolio that includes the option.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have automated the method, since it has been held that broadly providing a mechanical or automatic means to replace manual activity that accomplishes the same result involves only routine skill in the art. *In re Venner*, 120 USPQ 192.

Additionally, utilizing Monte Carlo techniques to derive an estimate of the distribution of variables is old and well known in the art of statistical analysis. As evidenced by Mendenhall which states "The technique of simulating a process that contains random elements and repeating the process over and over to see how it behaves is called a Monte Carlo Procedure." (see p. 177). It would have been obvious to one with ordinary skill in the art at the time invention was made to have modified Admission to incorporate a Monte Carlo technique, as disclosed by Mendenhall, to obtain random value samples by which to populate the equations and perform the computations.

### ***Response to Arguments***

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

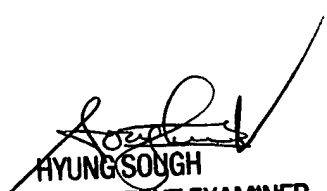
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Borlinghaus whose telephone number is (703) 308-9552. The examiner can normally be reached on 8:30am-5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung Sough can be reached on (703) 308-0505. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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